

Zhejiang Sunseeker Industrial Co., Ltd.

RF TEST REPORT

Report Type:

FCC Part 15.247 & ISSED RSS-247 RF report

Model:

RMX3000K20VU, RMX4000K20VU,
RMX6000K20VU, RMX8000K20VU,
RMX10000K20VU, RMX12000K20VU,
X7-3000, X7-4000, X7-6000,
X7-8000, X7-10000, X7-12000

Report Number:

2404B0243SHA-002

Issue Date:

May 28, 2024

Document Control Number:

TTRF15.247-02_V1 © 2018 Intertek



Applicant: Zhejiang Sunseeker Industrial Co., Ltd.
988 Jinde Road, Jiangdong Industrial Park, Jinhua, Zhejiang 321000,
P.R.China

Manufacturer: Zhejiang Sunseeker Industrial Co., Ltd.
988 Jinde Road, Jiangdong Industrial Park, Jinhua, Zhejiang 321000,
P.R.China

Manufacturing site: Zhejiang Sunseeker Industrial Co., Ltd.
988 Jinde Road, Jiangdong Industrial Park, Jinhua, Zhejiang 321000,
P.R.China

FCC ID: 2BFD7X35-1

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2023): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of
Unlicensed Wireless Devices

RSS-247 Issue 3 (August 2023): Digital Transmission Systems (DTSS), Frequency Hopping
Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (March 2019) Amendment 1: General Requirements for Compliance of Radio
Apparatus

PREPARED BY:

REVIEWED BY:

Project Engineer
Scout Gong

Reviewer
Eric Li

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

TEST REPORT

Content

REVISION HISTORY.....	5
MEASUREMENT RESULT SUMMARY	6
1 GENERAL INFORMATION	7
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	7
1.2 TECHNICAL SPECIFICATION.....	7
1.3 ANTENNA INFORMATION.....	7
1.4 DESCRIPTION OF TEST FACILITY	8
2 TEST SPECIFICATIONS.....	9
2.1 STANDARDS OR SPECIFICATION	9
2.2 MODE OF OPERATION DURING THE TEST	9
2.3 TEST SOFTWARE LIST.....	10
2.4 TEST PERIPHERALS LIST.....	10
2.5 TEST ENVIRONMENT CONDITION:	10
2.6 INSTRUMENT LIST	11
2.7 MEASUREMENT UNCERTAINTY	13
3 MINIMUM 6DB BANDWIDTH.....	14
3.1 LIMIT	14
3.2 MEASUREMENT PROCEDURE	14
3.3 TEST CONFIGURATION	14
3.4 TEST RESULTS OF MINIMUM 6DB BANDWIDTH	14
4 MAXIMUM CONDUCTED OUTPUT POWER AND E.I.R.P.....	15
4.1 LIMIT	15
4.2 MEASUREMENT PROCEDURE	15
4.3 TEST CONFIGURATION	15
4.4 TEST RESULTS OF MAXIMUM CONDUCTED OUTPUT POWER	15
5 POWER SPECTRUM DENSITY	16
5.1 LIMIT	16
5.2 MEASUREMENT PROCEDURE	16
5.3 TEST CONFIGURATION	16
5.4 TEST RESULTS OF POWER SPECTRUM DENSITY.....	16
6 EMISSION OUTSIDE THE FREQUENCY BAND	17
6.1 LIMIT	17
6.2 MEASUREMENT PROCEDURE	17
6.3 TEST CONFIGURATION	18
6.4 THE RESULTS OF EMISSION OUTSIDE THE FREQUENCY BAND	18
7 RADIATED EMISSIONS IN RESTRICTED FREQUENCY BANDS.....	19
7.1 LIMIT	19
7.2 MEASUREMENT PROCEDURE	19
7.3 TEST CONFIGURATION	21
7.4 TEST RESULTS OF RADIATED EMISSIONS	23
8 POWER LINE CONDUCTED EMISSION.....	26
8.1 LIMIT	26

TEST REPORT

8.2	TEST CONFIGURATION	26
8.3	MEASUREMENT PROCEDURE	27
8.4	TEST RESULTS OF POWER LINE CONDUCTED EMISSION.....	28
9	OCCUPIED BANDWIDTH	30
9.1	LIMIT	30
9.2	MEASUREMENT PROCEDURE	30
9.3	TEST CONFIGURATION	30
9.4	THE RESULTS OF OCCUPIED BANDWIDTH.....	30
10	ANTENNA REQUIREMENT	31
11	APPENDIX A: TEST RESULTS	32
11.1	DTS BANDWIDTH	32
	<i>Test Data</i>	32
	<i>Test Plots</i>	32
11.2	OCCUPIED CHANNEL BANDWIDTH	34
	<i>Test Data</i>	34
	<i>Test Plots</i>	34
11.3	MAXIMUM CONDUCTED OUTPUT POWER.....	36
	<i>Test Data</i>	36
	<i>Test Plots</i>	36
11.4	MAXIMUM POWER SPECTRAL DENSITY	38
	<i>Test Data</i>	38
	<i>Test Plots</i>	38
11.5	BAND EDGE MEASUREMENTS	40
	<i>Test Data</i>	40
	<i>Test Plots</i>	40
11.6	CONDUCTED SPURIOUS EMISSION	42
	<i>Test Data</i>	42
	<i>Test Plots</i>	42

Revision History

Report No.	Version	Description	Issued Date
2404B0243SHA-002	Rev. 01	Initial issue of report	May 28, 2024

Measurement Result Summary

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-247 Issue 3 Clause 5.2	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	RSS-247 Issue 3 Clause 5.4	Pass
Power spectrum density	15.247(e)	RSS-247 Issue 3 Clause 5.2	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 3 Clause 5.5	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.207(a)	RSS-Gen Issue 5 Clause 8.8	Pass
Occupied bandwidth	-	RSS-Gen Issue 5 Clause 6.6	Tested
Antenna requirement	15.203	-	Pass

Notes:

1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

TEST REPORT

1 General Information

1.1 Description of Equipment Under Test (EUT)

Product name:	Robotic Lawn Mower
Type/Model/PMN/HVIN:	RMX3000K20VU, RMX4000K20VU, RMX6000K20VU, RMX8000K20VU, RMX10000K20VU, RMX12000K20VU, X7-3000, X7-4000, X7-6000, X7-8000, X7-10000, X7-12000
Description of EUT:	EUT is a Robotic lawn mower, there are nine models, all models are technically identical on mower unit except specific accessories used and declared working area by manufacturer. We tested RMX12000K20VU as representative and listed the worst results in this report.
Rating:	20 V d.c., Class III, IPX5 for mower unit, IPX4 for charging station. n0: 3000 /min, Cutting width 35cm.
Category of EUT:	Class B
EUT type:	☐ Tabletop ☒ Floor standing
Software Version:	-
Hardware Version:	-
Sample Identification No.:	0240306-05-004
Sample received date:	March 6, 2024
Date of test:	March 7, 2024, to May 27, 2024

1.2 Technical Specification

Frequency Band:	2402MHz ~ 2480MHz
Support Standards:	Bluetooth Low Energy
Type of Modulation:	GFSK
Channel Number:	40
Data Rate:	1Mbps
Channel Separation:	2MHz

1.3 Antenna Information

No.	Antenna Type	Gain	Note
1	Copper tube antenna	2.37 dBi	External type

1.4 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road (North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Member No: 3598 (Registration No.: R-14243, G-10845, C-14723, T-12252)
	A2LA Accreditation Lab Certificate Number: 3309.02

TEST REPORT

2 Test Specifications

2.1 Standards or Specification

47CFR Part 15 (2021)

ANSI C63.10 (2013)

KDB 558074 (v05r02)

RSS-247 Issue 3 (August 2023)

RSS-Gen Issue 5 (March 2019) Amendment 1

2.2 Mode of Operation During the Test

The lowest, middle and highest channels were tested as representatives.

Frequency Band (MHz)				2400 ~ 2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Data rate VS Power:

The test setting software is offered by the applicant. The pre-scan for the conducted power with all rates in each modulation and bands were used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter			
Test Software	Xshell v7.0.0109p		
Working Mode	BLE		
Test Channel	2402MHz	2440MHz	2480MHz

While testing transmitting mode of EUT, the internal modulation and continuous transmission was applied.

Radiated test mode: EUT transmitted signal with antenna.

Conducted test mode: EUT transmitted signal from RF port connected to SPA directly.

TEST REPORT

2.3 Test Software List

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test Peripherals List

Item No.	Name	Band and Model	Description
1	Laptop computer	DELL 5480	100-240V AC, 50/60Hz

2.5 Test Environment Condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	25°C	52% RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Radiated Emissions in restricted frequency bands	24°C	53% RH
Power line conducted emission	24°C	52% RH

TEST REPORT

2.6 Instrument List

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESR7	EC 6194	2025-02-27
☒	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2024-12-07
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2024-11-19
☐	A.M.N.	R&S	ENV 216	EC 3393	2024-07-17
☐	A.M.N.	R&S	ENV4200	EC 3558	2024-06-05
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-22
☒	Test Receiver	R&S	ESR	EC 6501	2024-09-24
☒	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-09-12
☒	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC 6402	2025-02-14
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC 5262	2024-06-15
☐	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2024-12-07
☐	Horn antenna	Tonscend	bha9120d	EC 6432-2	2025-02-15
☒	Horn antenna	ETS	3117	EC 4792-1	2024-09-15
☒	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2026-09-12
☐	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-07-16
☒	Horn antenna	ETS	3116c	EC 5955	2024-07-22
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2025-03-07
☐	Power sensor	Agilent	U2021XA	EC 5338-1	2025-03-07
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2025-03-07
☐	Universal Radio Communication Tester	R&S	CMW500	EC 5944	2025-03-07
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2025-03-07
☐	Mobile Test System	Litepoint	lqxel	EC 5176	2025-01-11
☐	Test Receiver	R&S	ESCI 7	EC 4501	2024-12-09

TEST REPORT

☐	Climate chamber	GWS	MT3065	EC 6021	2025-03-06
☐	Spectrum Analyzer	Keysight	N9030B	EC 6078	2024-06-08
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2025-01-11
☐	Shielded room	Zhongyu	-	EC 2839	2025-01-11
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-07-08
☐	Fully-anechoic chamber	Albatross project	-	EC 3047	2024-07-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Thermo-Hygrograph	Testo	175h1	EC 6640	2024-08-28
☐	Thermo-Hygrograph	Testo	175h1	EC 6641	2024-08-28
☒	Thermo-Hygrograph	Testo	175h1	EC6642	2024-08-28
☒	Thermo-Hygrograph	Testo	175h1	EC 6643	2024-08-28
☐	Thermo-Hygrograph	Testo	175h1	EC 6644	2024-08-28
☐	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

TEST REPORT

2.7 Measurement Uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	$\pm 0.74\text{dB}$
Power spectrum density	$\pm 0.74\text{dB}$
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Emission outside the frequency band	$\pm 2.89\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$
Minimum 6dB Bandwidth	$\pm 0.84 \times 10^{-7}$
Occupied bandwidth	$\pm 0.84 \times 10^{-7}$

TEST REPORT

3 Minimum 6dB Bandwidth

Test Result: Pass

3.1 Limit

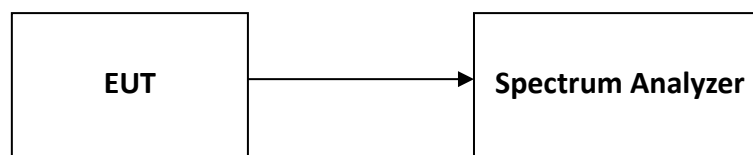
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

The minimum 6dB bandwidth is measured using the Spectrum Analyzer according to DTS test procedure of “558074 D01 15.247 Meas Guidance v05r02” (clause 8.2) for compliance requirements.

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.3 Test Configuration



3.4 Test Results of Minimum 6dB Bandwidth

Please refer to Appendix A.

4 Maximum Conducted Output Power and e.i.r.p.

Test Result: Pass

4.1 Limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

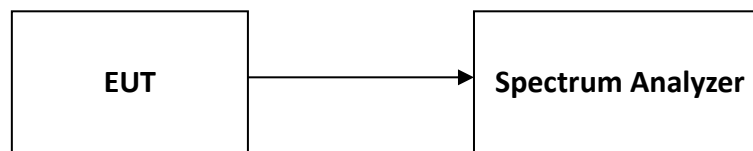
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

The EUT was tested according to DTS test procedure of “558074 D01 15.247 Meas Guidance v05r02” (clause 8.3.1) for compliance requirements.

- a) Set the RBW $\geq$ DTS bandwidth.
- b) Set VBW $\geq 3 \times$ RBW.
- c) Set span $\geq 3 \times$ RBW.
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

4.3 Test Configuration



4.4 Test Results of Maximum Conducted Output Power

Please refer to Appendix A.

TEST REPORT

5 Power Spectrum Density

Test Result: Pass

5.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

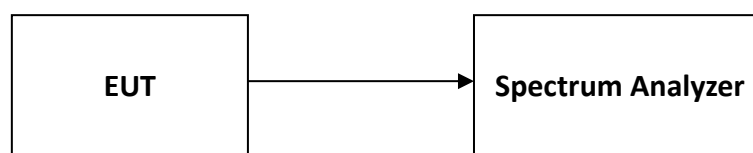
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

5.2 Measurement Procedure

The power output was tested according to DTS test procedure of “558074 D01 15.247 Meas Guidance v05r02” (clause 8.4) for compliance requirements.

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3 Test Configuration



5.4 Test Results of Power Spectrum Density

Please refer to Appendix A.

TEST REPORT

6 Emission Outside the Frequency Band

Test Result: Pass

6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

6.2 Measurement Procedure

The EUT was tested according to DTS test procedure of “558074 D01 15.247 Meas Guidance v05r02” (clause 8.5) for compliance requirements.

Reference level measurement

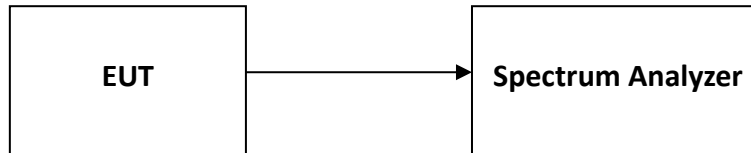
Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to ≥ 1.5 times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW $\geq 3 \times$ RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

Emission level measurement

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW $\geq 3 \times$ RBW.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

TEST REPORT**6.3 Test Configuration****6.4 The Results of Emission Outside the Frequency Band**

Please refer to Appendix A.

TEST REPORT

7 Radiated Emissions in Restricted Frequency Bands

Test Result: Pass

7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Measurement Procedure

For Radiated emission below 30MHz:

- The EUT was placed on the top of a rotating table 0.1 meters above the ground in a 3-meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

TEST REPORT**For Radiated emission above 30MHz:**

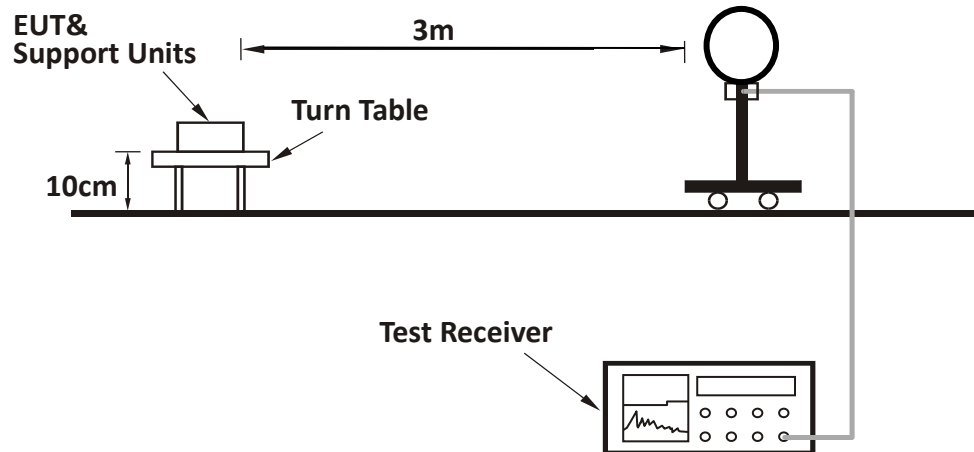
- a) The EUT was placed on the top of a rotating table 0.1 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna varies from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets the average limit, measurement with the average detector is unnecessary.

Note:

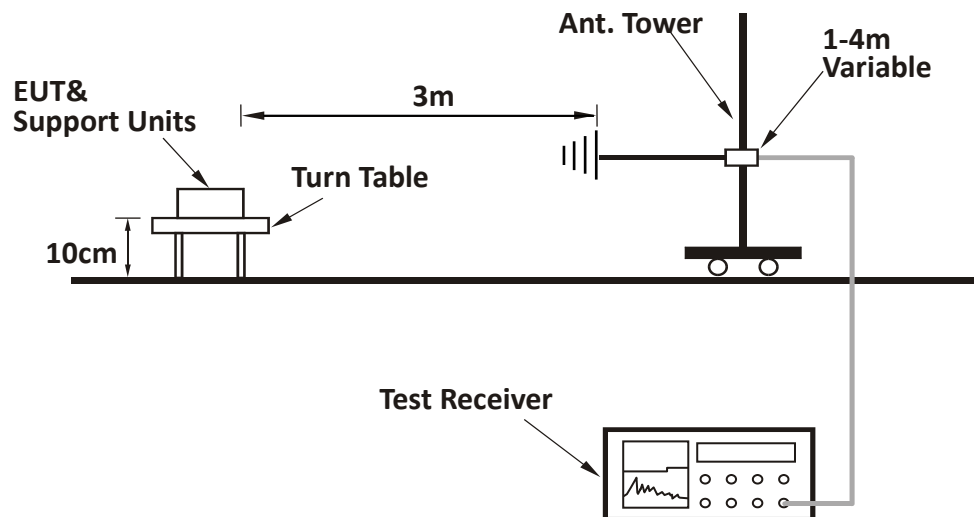
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz, and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz, and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or $3 \times \text{RBW}$ (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated, and the worst-case emissions are reported.

7.3 Test Configuration

For radiated emission below 30MHz:

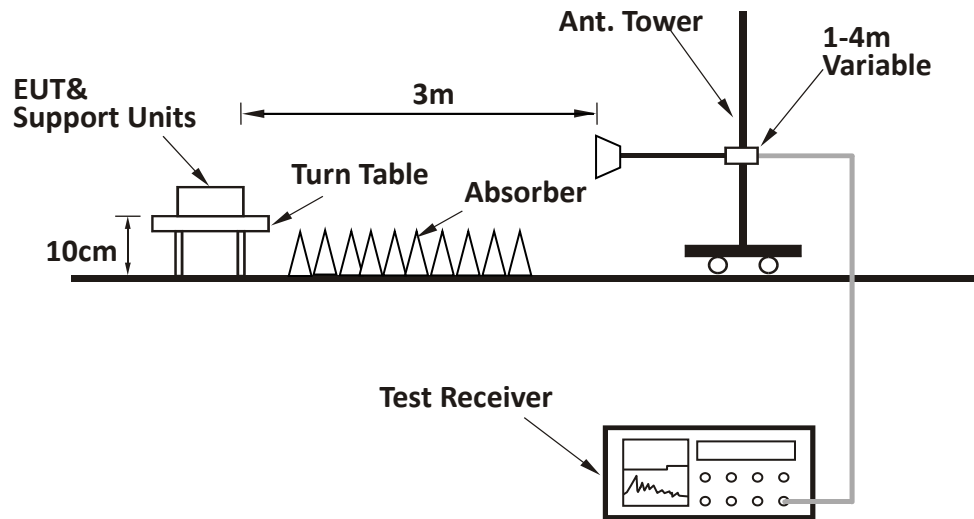


For radiated emission 30MHz to 1GHz:



TEST REPORT

For radiated emission above 1GHz:

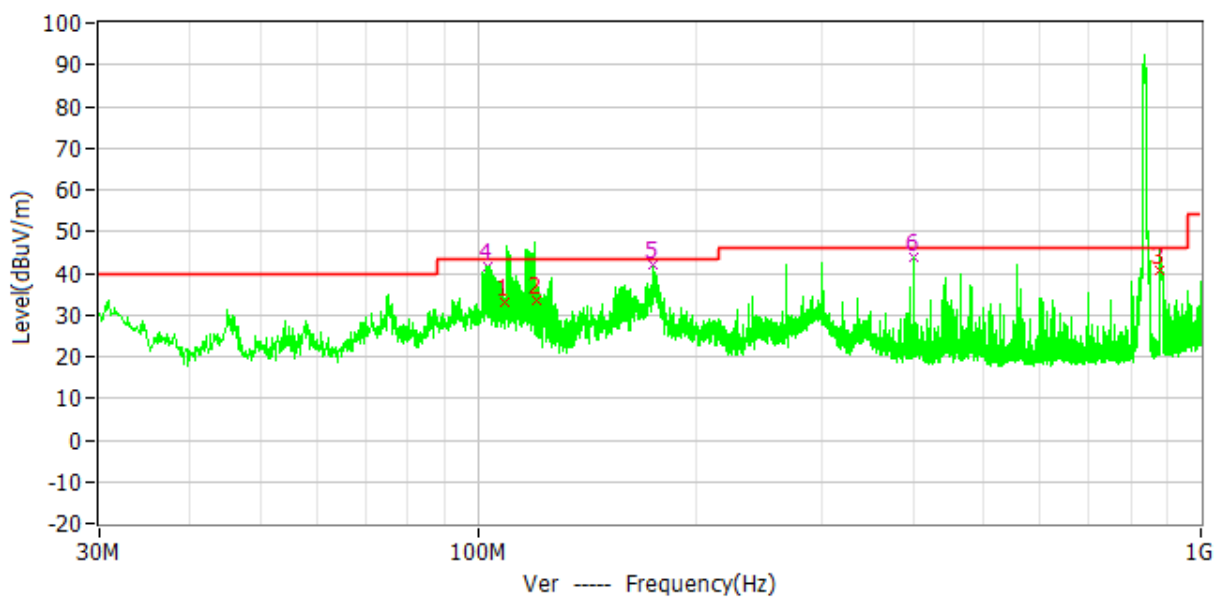
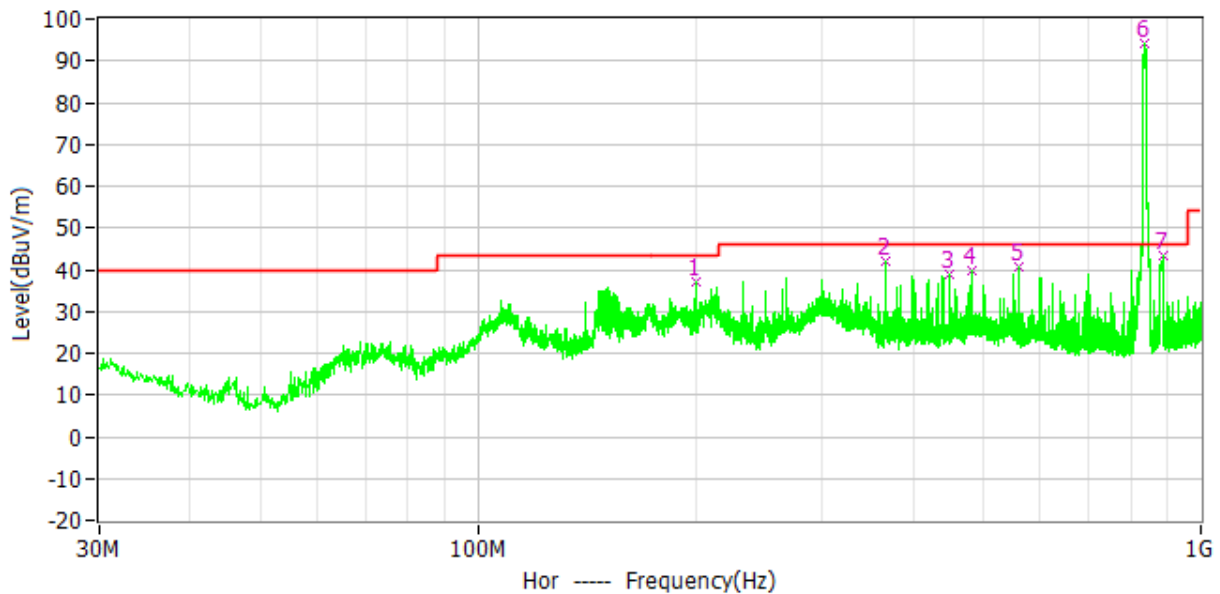


TEST REPORT

7.4 Test Results of Radiated Emissions

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported. The worst waveform from 30MHz to 1000MHz is listed as below:

Test Curve (30M to 1GHz):



TEST REPORT

Test Data:

Polarization	Frequency	Limit (dBuV/m)	Corrected Reading (dBuV/m)	Margin (dBuV/m)	Detector
Horizontal	199.944MHz	43.50	36.90	6.60	PK
	366.687MHz	46.00	42.10	3.90	PK
	450.010MHz	46.00	38.90	7.10	PK
	483.378MHz	46.00	39.90	6.10	PK
	559.620MHz	46.00	40.50	5.50	PK
	885.734MHz	46.00	43.40	2.60	PK
	1-25GHz	54.00	<44.00	>10.00	AV
	1-25GHz	74.00	<64.00	>10.00	PK
Vertical	108.877MHz	43.50	33.20	10.30	PK
	120.540MHz	43.50	33.50	10.00	PK
	879.270MHz	46.00	40.50	5.50	PK
	103.138MHz	43.50	41.50	2.00	PK
	175.015MHz	43.50	41.80	1.70	PK
	399.958MHz	46.00	43.70	2.30	PK
	1-25GHz	54.00	<44.00	>10.00	AV
	1-25GHz	74.00	<64.00	>10.00	PK

Note: The signal of 824MHz was caused by the control unit module. It's a wanted signal.

Remark:

1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example:

Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,

Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,

Limit = 40.00dBuV/m.

Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m.

Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m.

Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

TEST REPORT

Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz.

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	51.10	74.00	22.90	PK
	V	2390.00	50.90	74.00	23.10	PK
	H	4804.00	45.20	74.00	28.80	PK
	V	4804.00	45.40	74.00	28.60	PK
M	H	4880.00	46.10	74.00	27.90	PK
	V	4880.00	46.20	74.00	27.80	PK
H	H	2483.50	50.90	74.00	23.10	PK
	V	2483.50	51.10	74.00	22.90	PK
	H	4960.00	45.80	74.00	28.20	PK
	V	4960.00	45.40	74.00	28.60	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,

Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,

Limit = 40.00dBuV/m.

Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m.

Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m.

Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

8 Power Line Conducted Emission

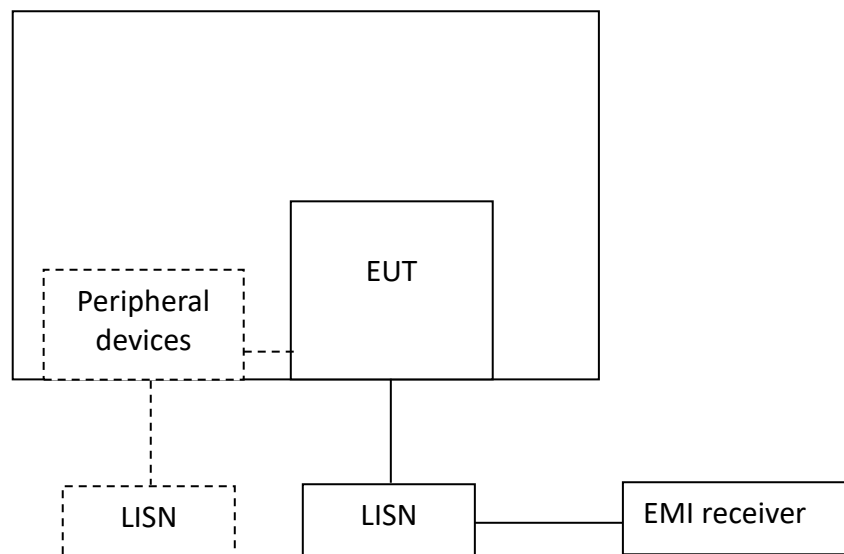
Test Result: Pass

8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

8.2 Test Configuration



TEST REPORT**8.3 Measurement Procedure**

Measured levels of ac powerline conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

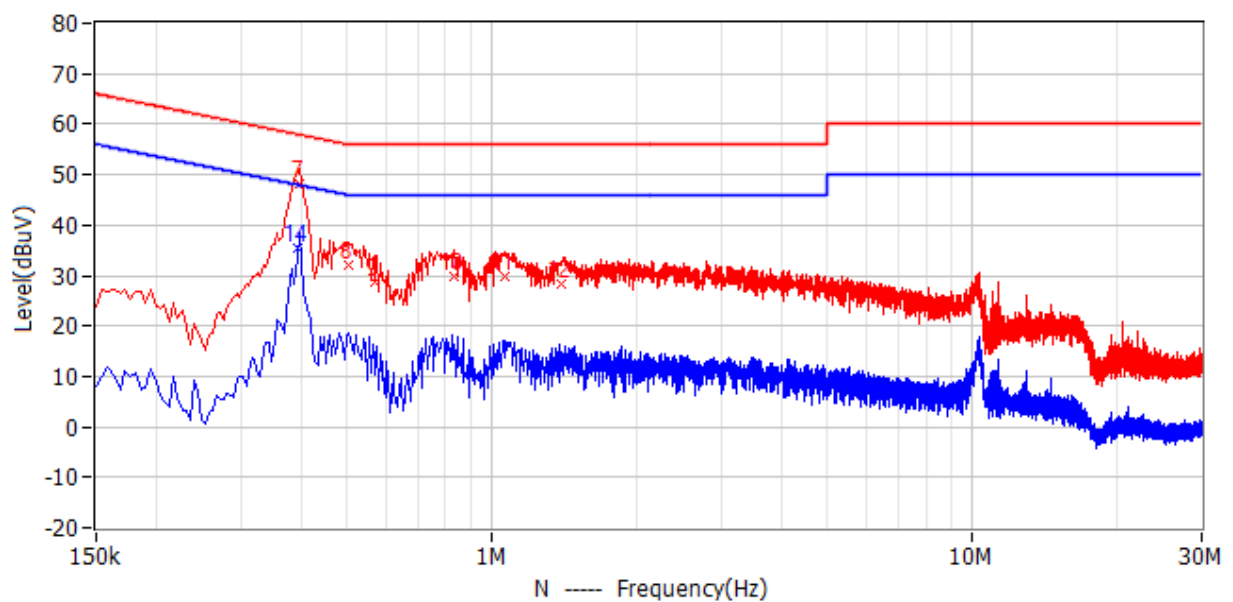
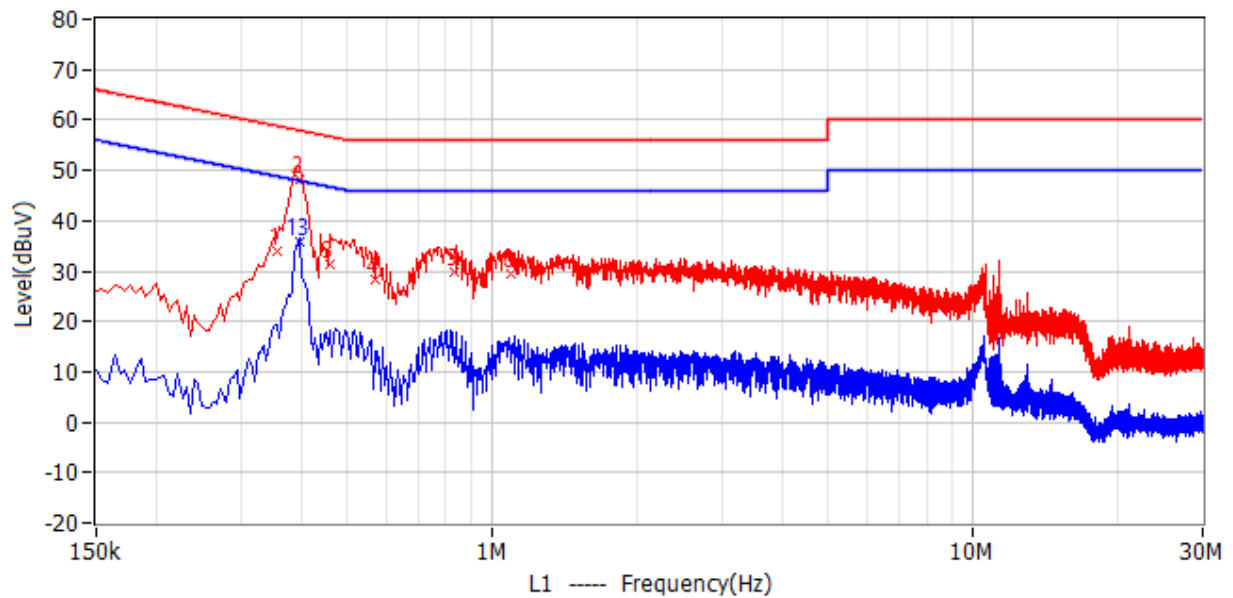
The bandwidth of the test receiver is set at 9 kHz.

TEST REPORT

8.4 Test Results of Power Line Conducted Emission

Test Voltage: AC 120V, 60Hz.

Test Curve:



TEST REPORT

Test Data:

No.	Frequency	Limit (dBuV)	Level (dBuV)	Delta (dB)	Reading (dBuV)	Factor (dB)	Detector	Phase
1	357.000kHz	58.80	33.90	-24.90	27.70	6.20	QP	L1
2	397.500kHz	57.90	48.20	-9.70	42.00	6.20	QP	L1
3	460.500kHz	56.70	31.40	-25.30	25.20	6.20	QP	L1
4	568.500kHz	56.00	28.40	-27.60	22.20	6.20	QP	L1
5	834.000kHz	56.00	29.70	-26.30	23.50	6.20	QP	L1
6	1.091MHz	56.00	29.50	-26.50	23.30	6.20	QP	L1
7	397.500kHz	57.90	48.30	-9.60	42.10	6.20	QP	N
8	501.000kHz	56.00	32.00	-24.00	25.80	6.20	QP	N
9	568.500kHz	56.00	28.60	-27.40	22.40	6.20	QP	N
10	834.000kHz	56.00	30.00	-26.00	23.80	6.20	QP	N
11	1.068MHz	56.00	29.90	-26.10	23.70	6.20	QP	N
12	1.392MHz	56.00	28.40	-27.60	22.20	6.20	QP	N
13	397.500kHz	47.90	35.90	-12.00	29.70	6.20	CAV	L1
14	393.000kHz	48.00	35.60	-12.40	29.40	6.20	CAV	N

Remark:

1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
2. Level = Original Receiver Reading + Factor.
3. Delta = Level - Limit

Example:

Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB, Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.

Then Factor = 10.00 + 2.00 = 12.00dB.

Level = 10dBuV + 12.00dB = 22.00dBuV.

Delta = 22.00dBuV - 66.00dBuV = -44.00dB.

9 Occupied Bandwidth

Test Result: Tested

9.1 Limit

None.

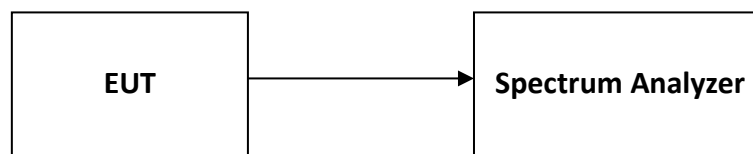
9.2 Measurement Procedure

The occupied bandwidth per RSS-Gen was measured using the Spectrum Analyzer.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

9.3 Test Configuration



9.4 The Results of Occupied Bandwidth

Please refer to Appendix A.

TEST REPORT**10 Antenna Requirement****Requirement:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Result:

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

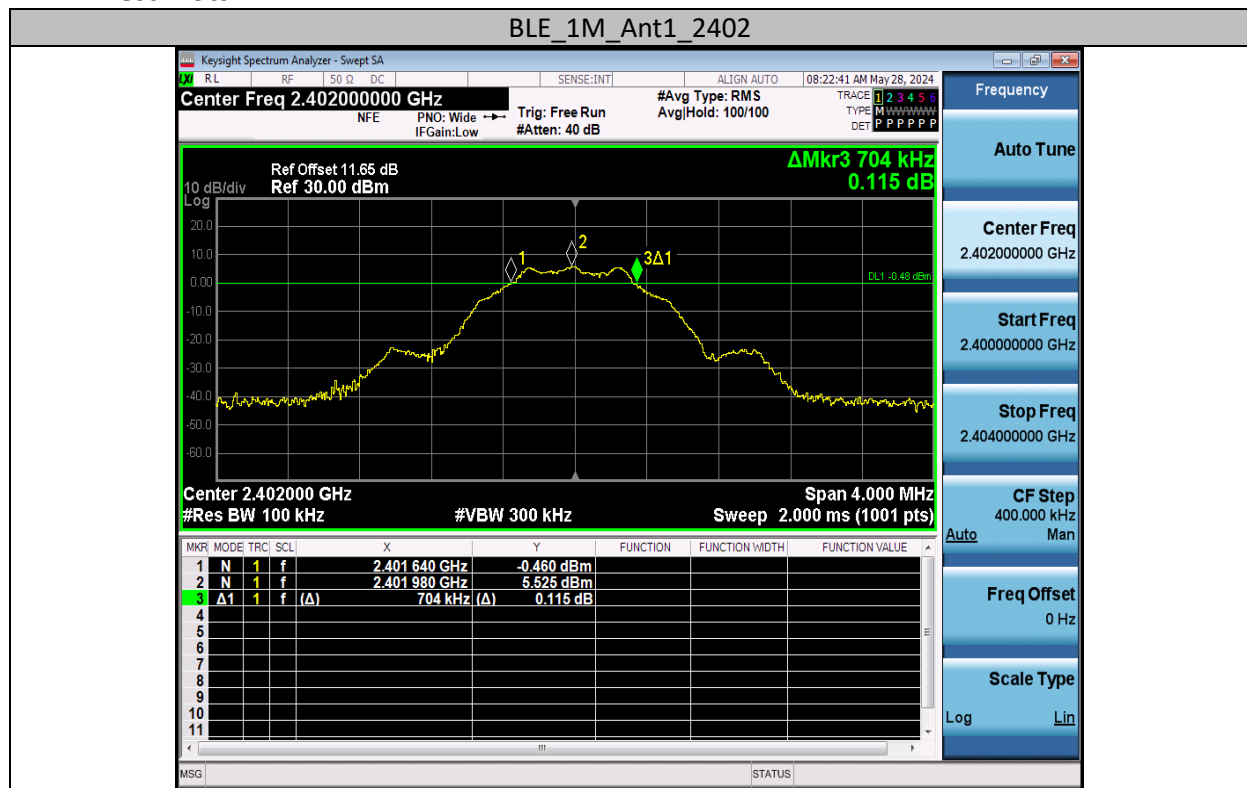
11 Appendix A: Test Results

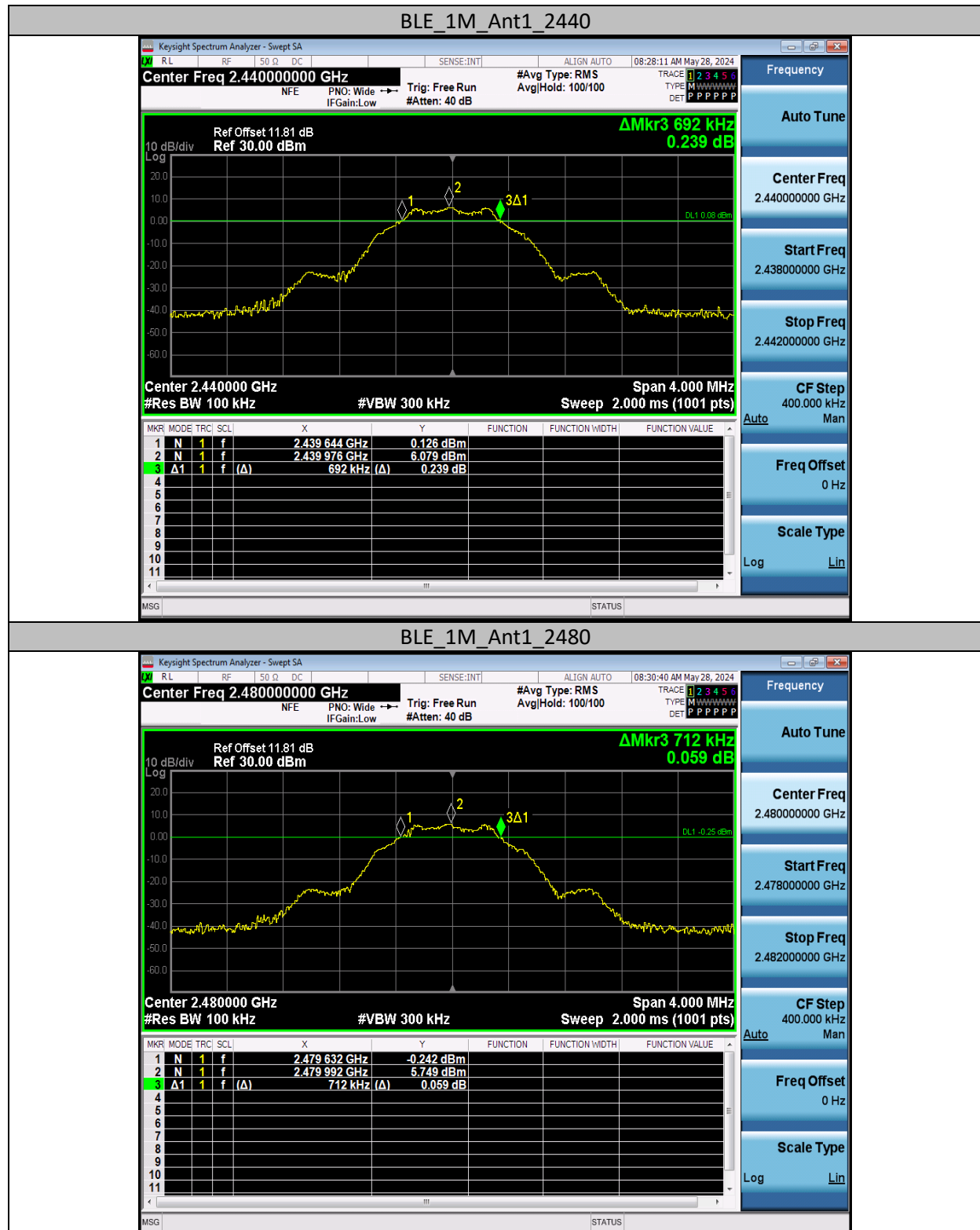
11.1 DTS Bandwidth

Test Data

Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit [MHz]	Verdict
BLE_1M	Ant1	2402	0.704	2401.640	2402.344	0.5	PASS
		2440	0.692	2439.644	2440.336	0.5	PASS
		2480	0.712	2479.632	2480.344	0.5	PASS

Test Plots





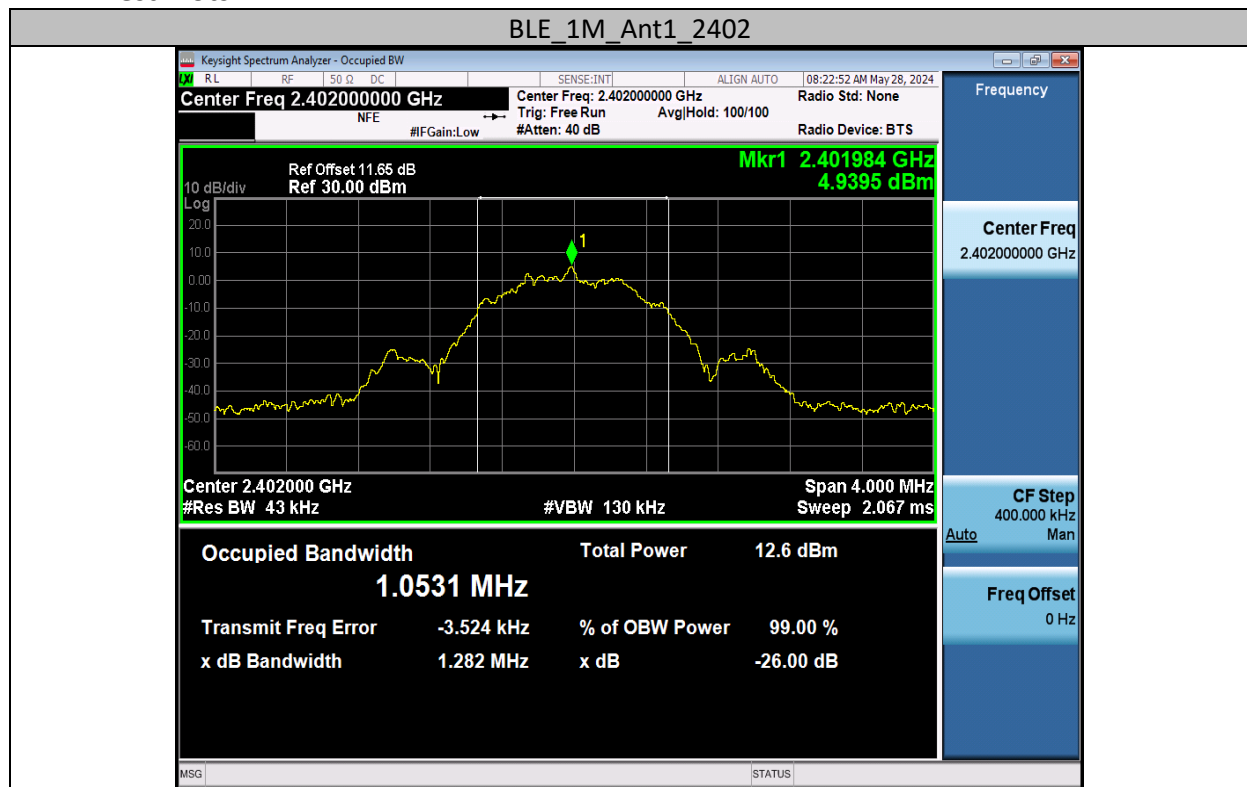
TEST REPORT

11.2 Occupied Channel Bandwidth

Test Data

Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit [MHz]	Verdict
BLE_1M	Ant1	2402	1.0531	2401.4699	2402.5230	---	---
		2440	1.0563	2439.4718	2440.5281	---	---
		2480	1.0549	2479.4710	2480.5259	---	---

Test Plots





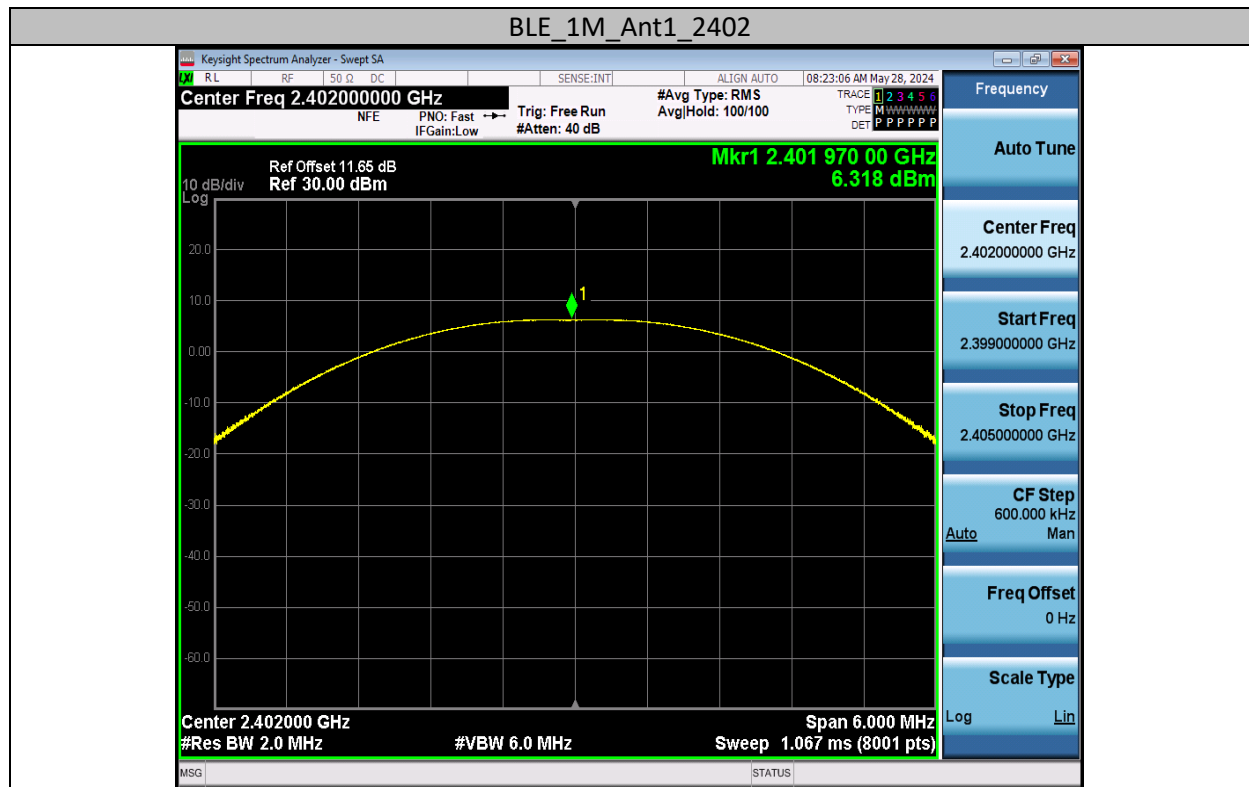
TEST REPORT

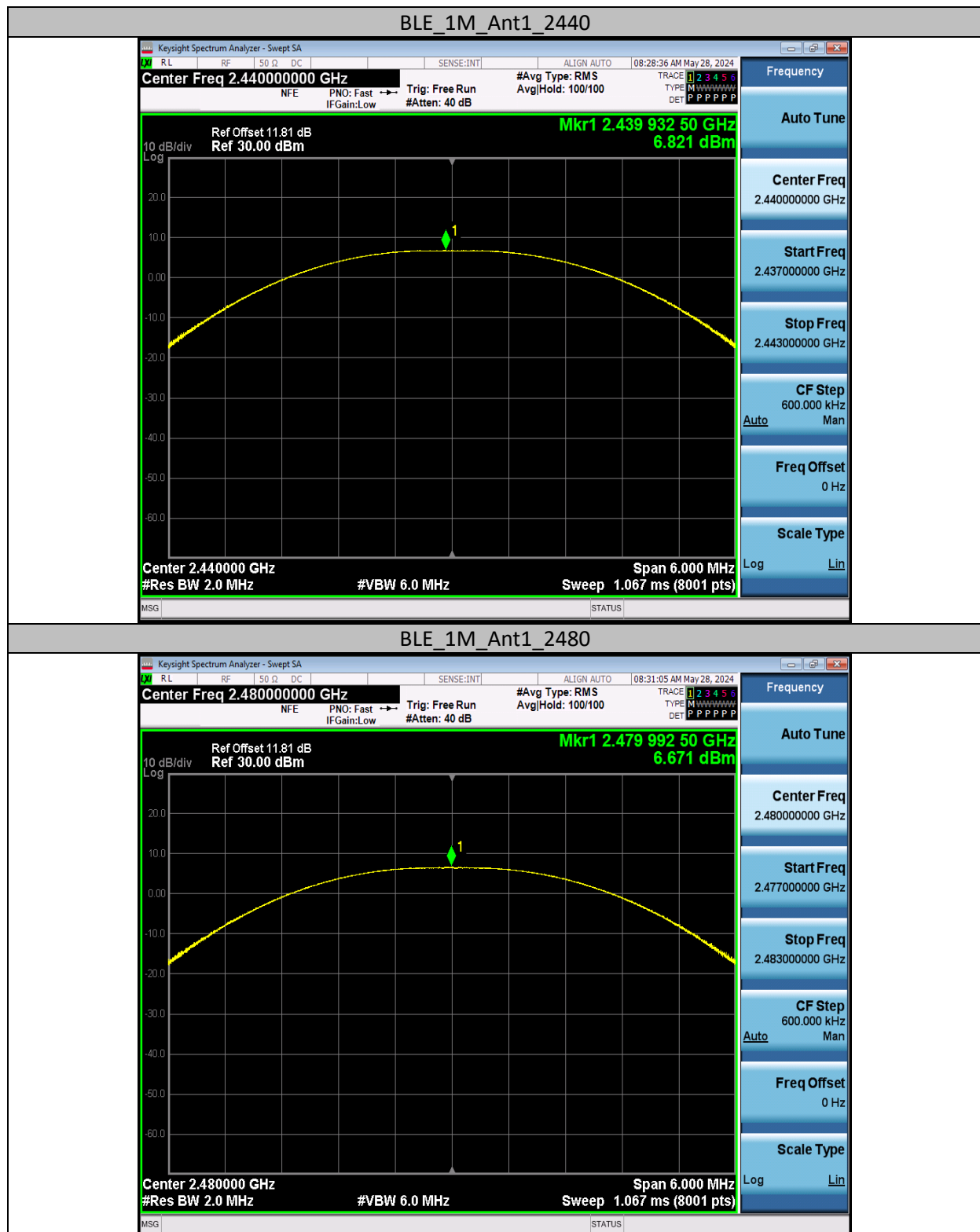
11.3 Maximum Conducted Output Power

Test Data

Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	EIRP [dBm]	EIRP Limit[dBm]	Verdict
BLE_1M	Ant1	2402	6.32	≤30	8.69	≤36	PASS
		2440	6.82	≤30	9.19	≤36	PASS
		2480	6.67	≤30	9.04	≤36	PASS

Test Plots





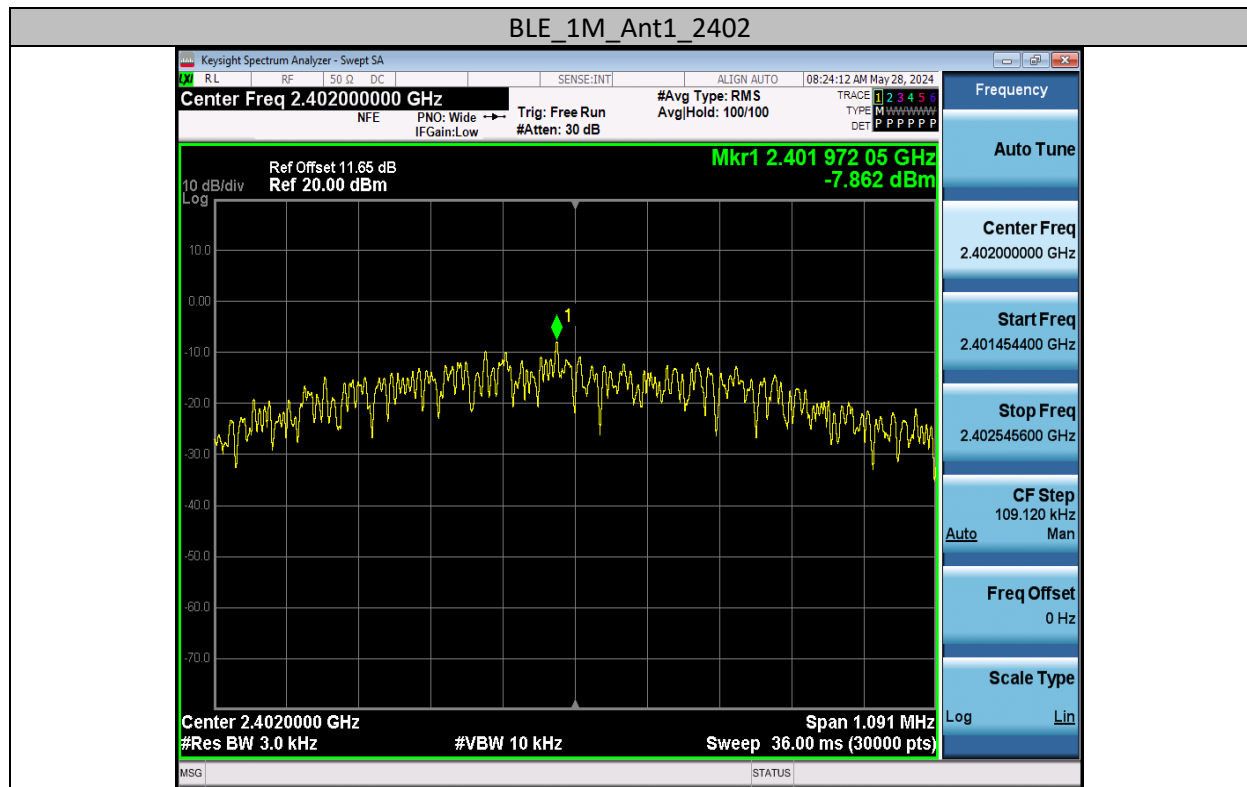
TEST REPORT

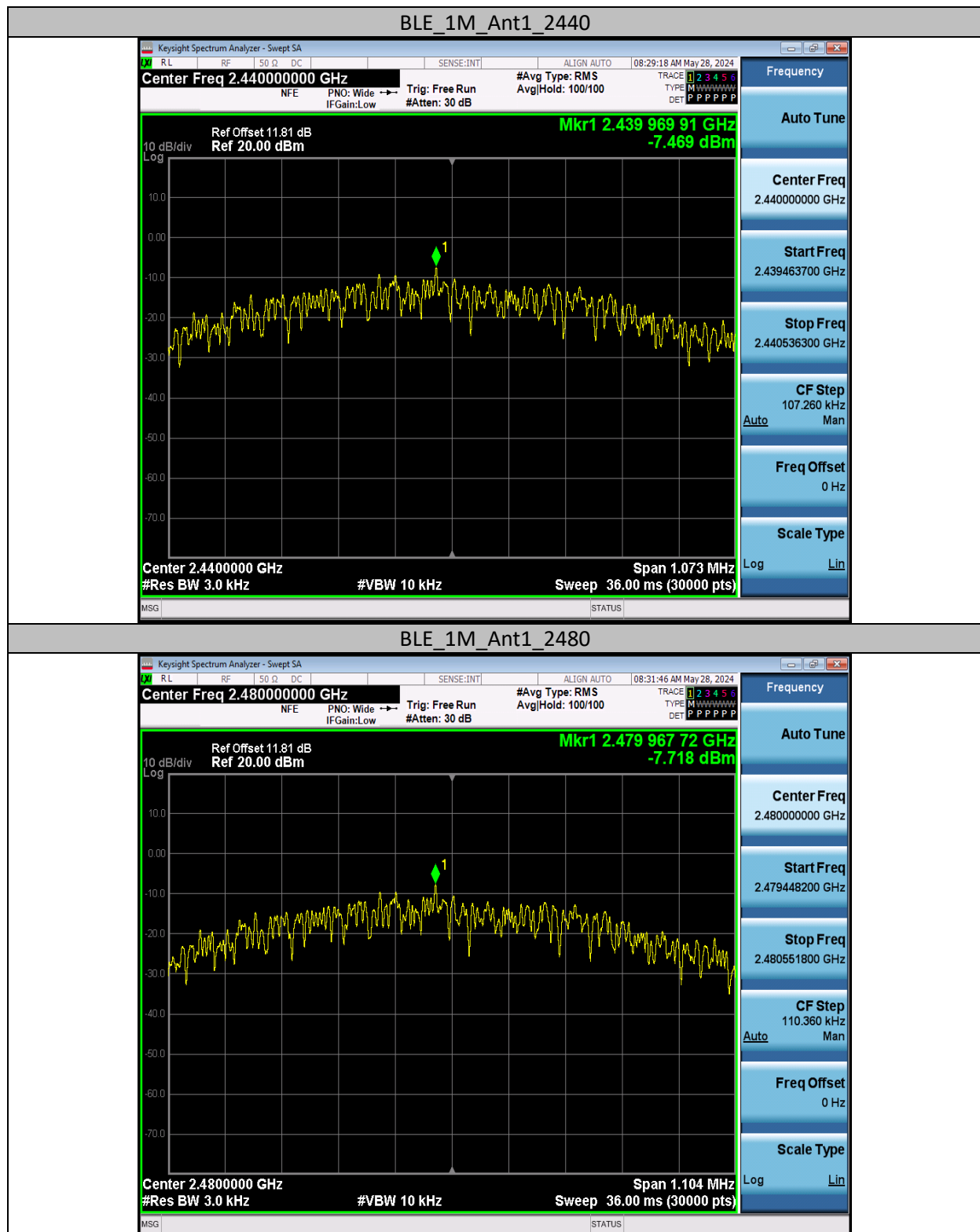
11.4 Maximum Power Spectral Density

Test Data

Test Mode	Antenna	Frequency [MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-7.86	≤8.00	PASS
		2440	-7.47	≤8.00	PASS
		2480	-7.72	≤8.00	PASS

Test Plots





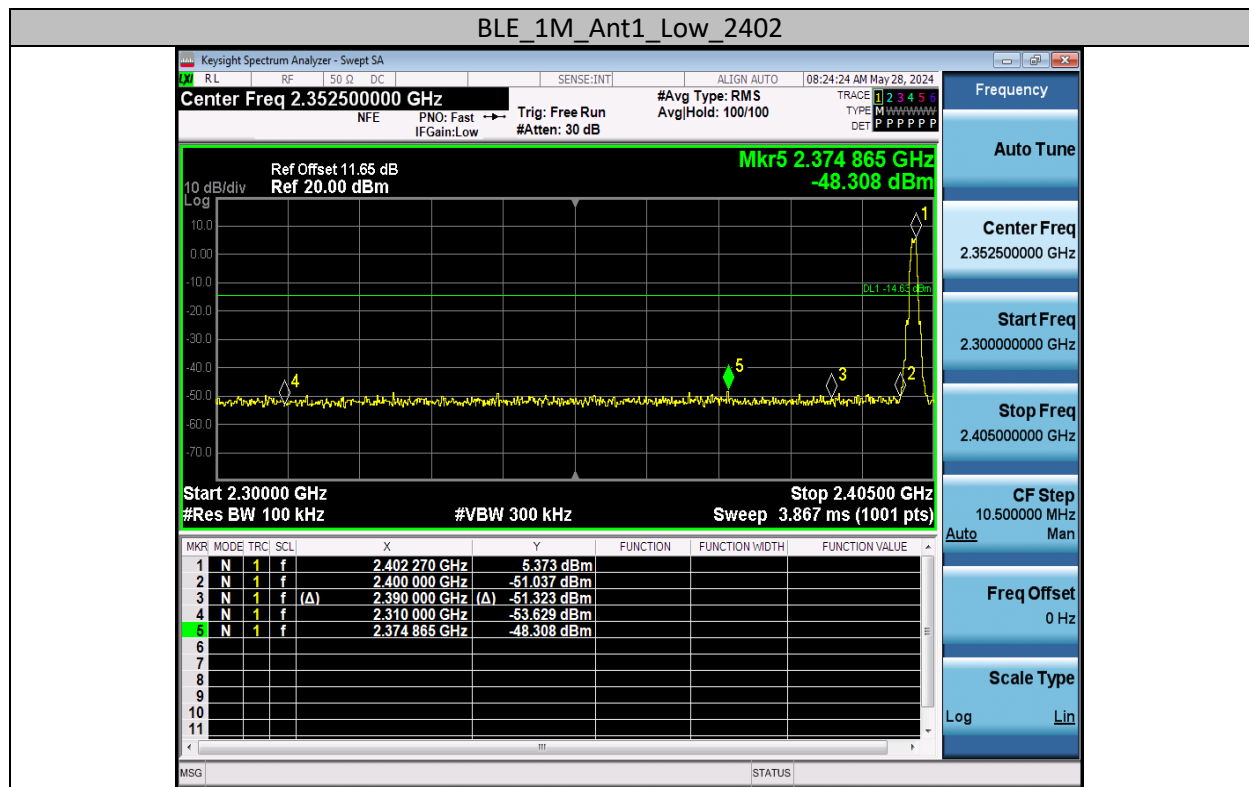
TEST REPORT

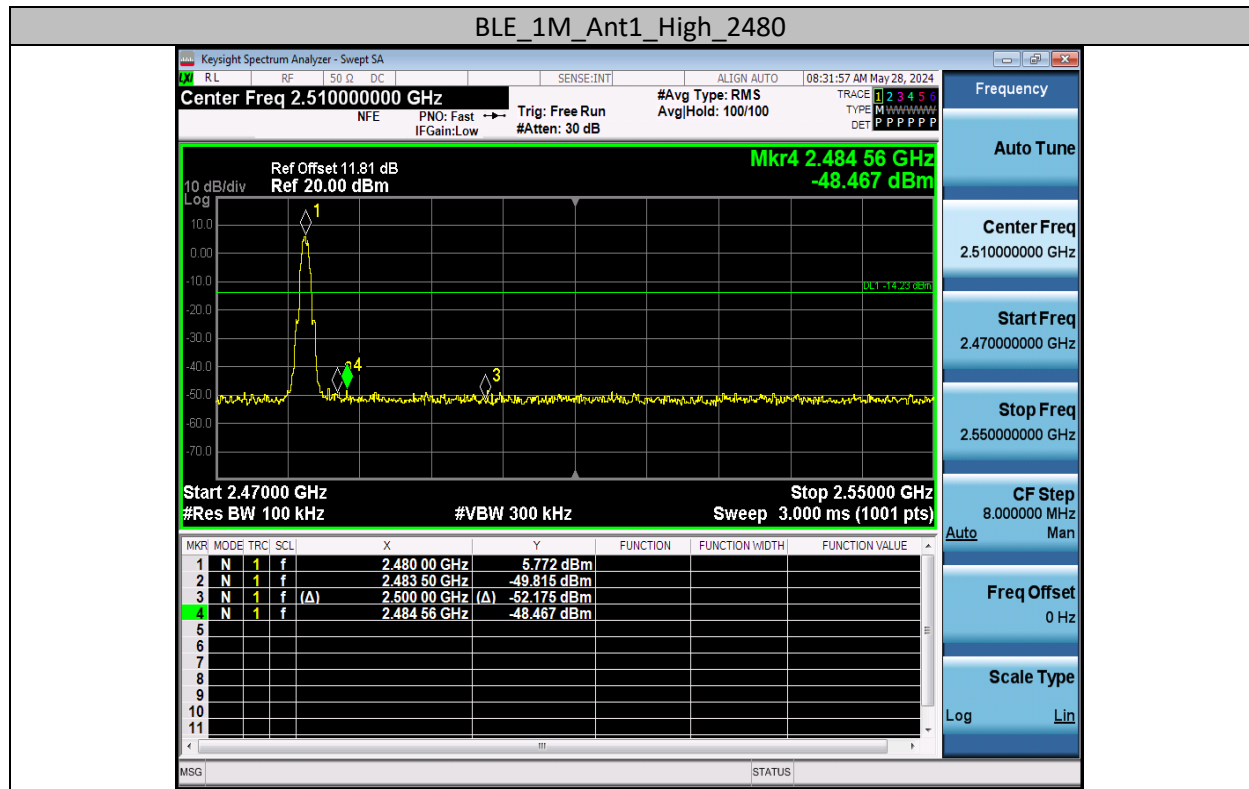
11.5 Band Edge Measurements

Test Data

Test Mode	Antenna	ChName	Frequency [MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	5.37	-48.31	≤-14.63	PASS
		High	2480	5.77	-48.47	≤-14.23	PASS

Test Plots





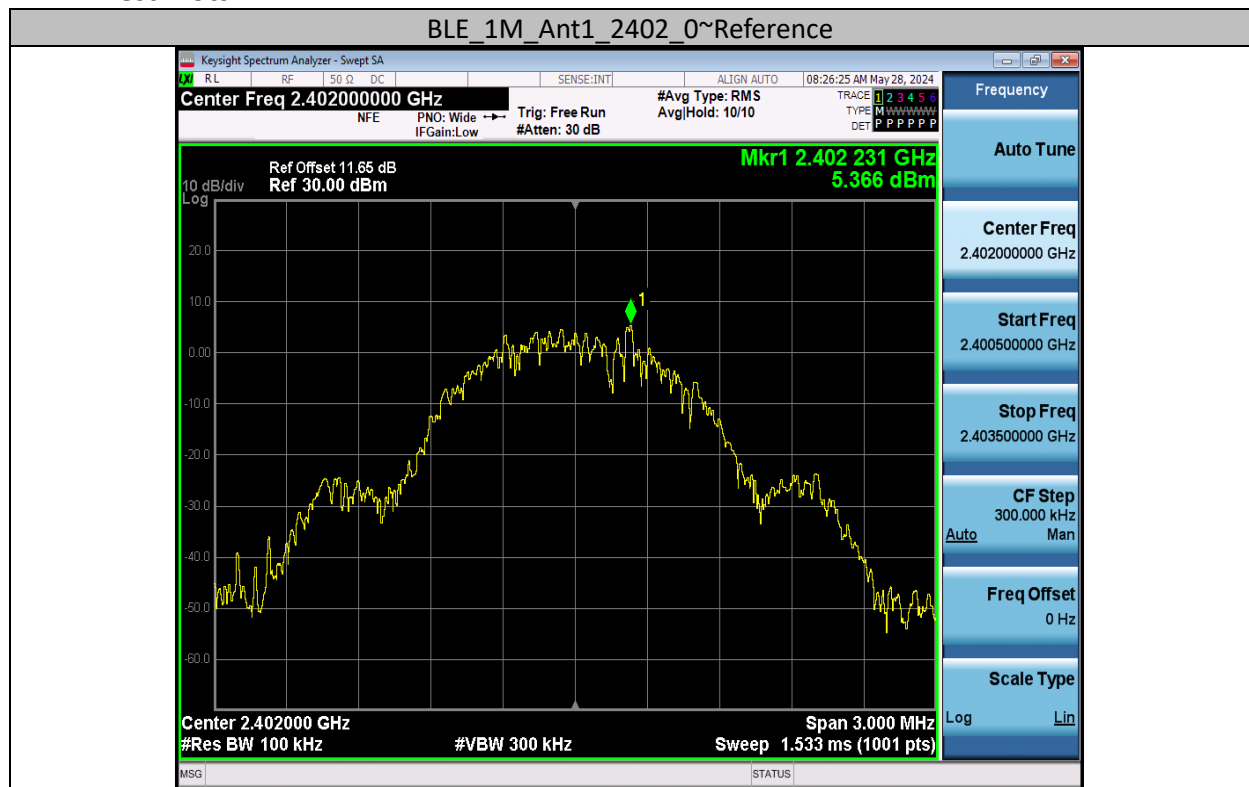
TEST REPORT

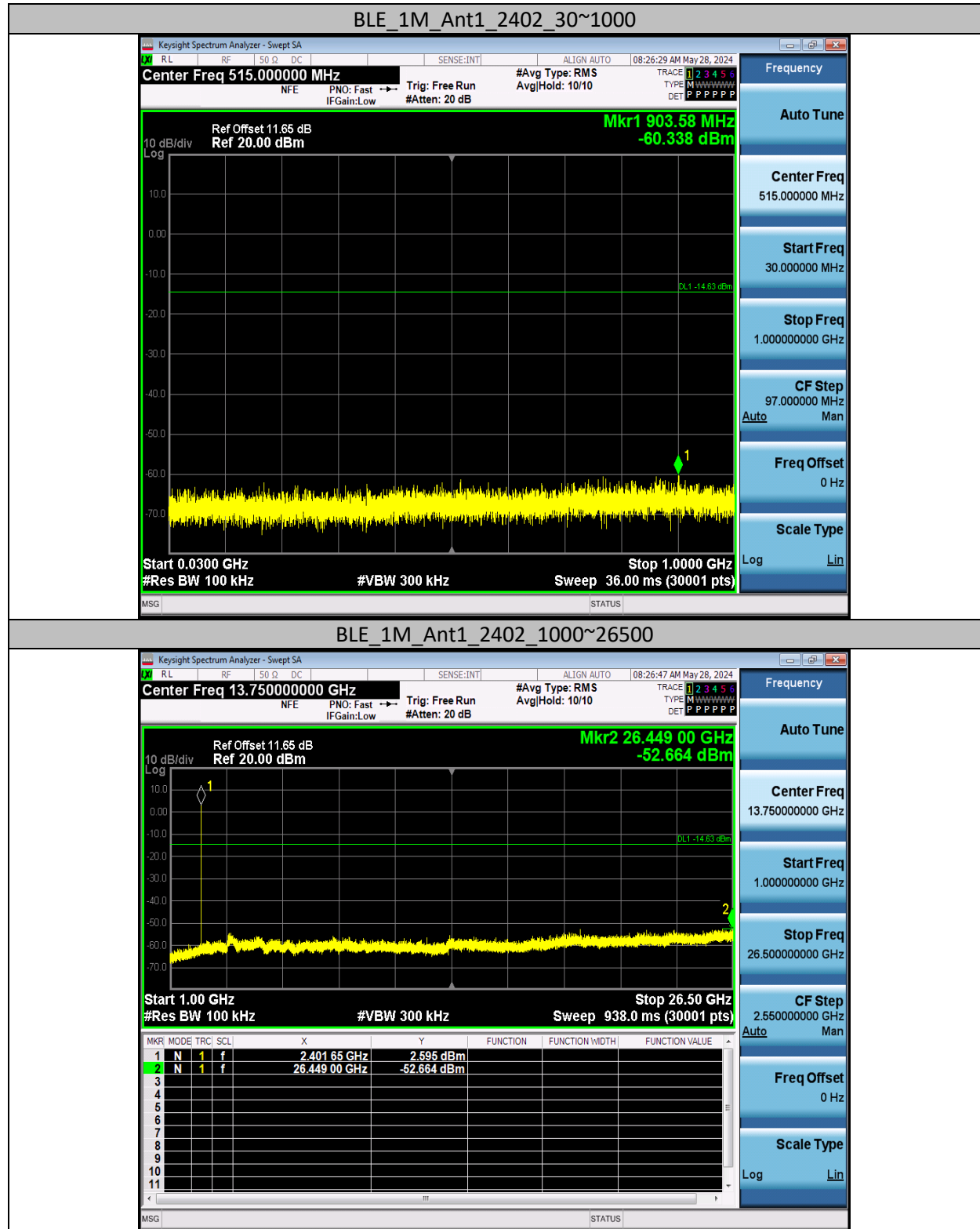
11.6 Conducted Spurious Emission

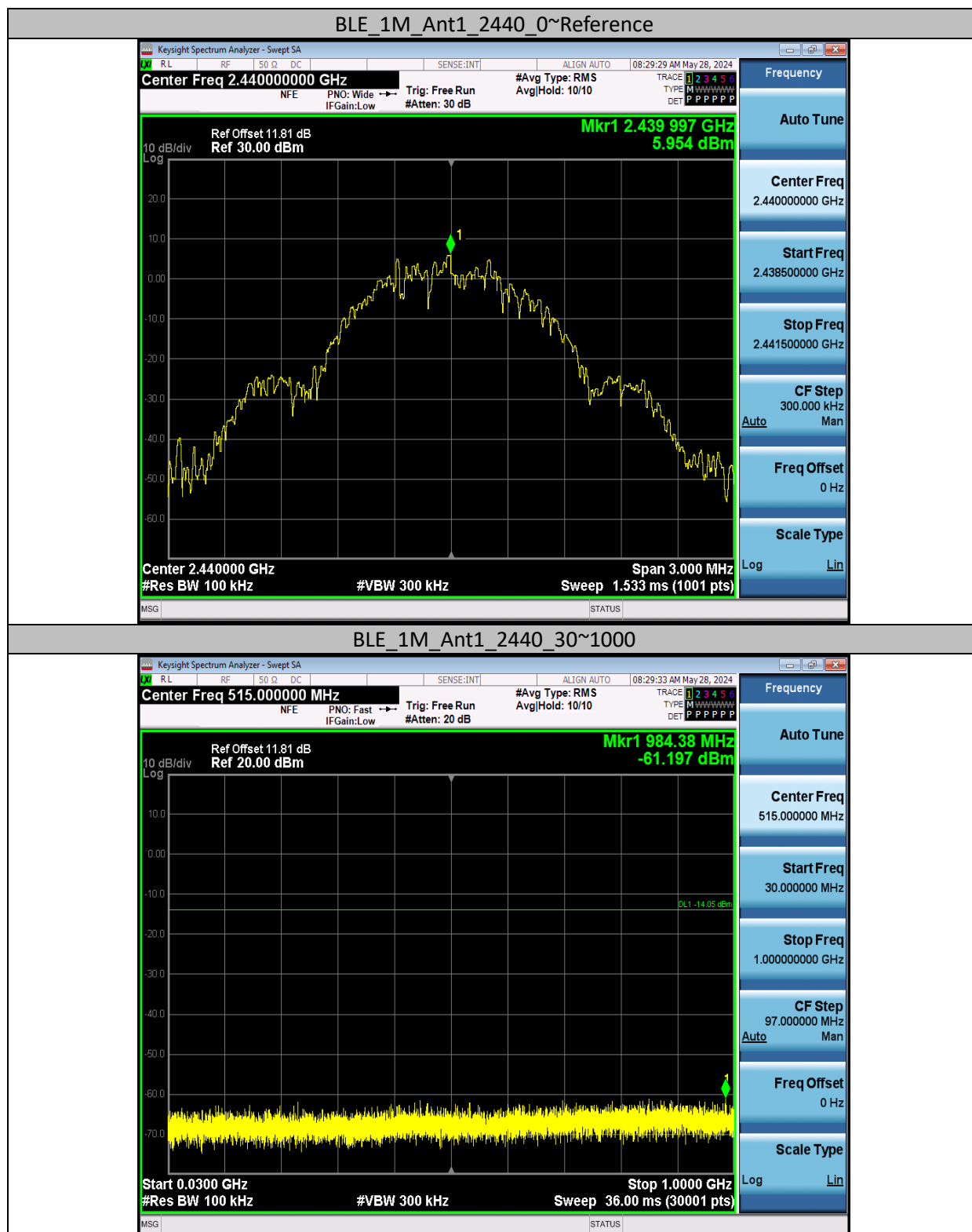
Test Data

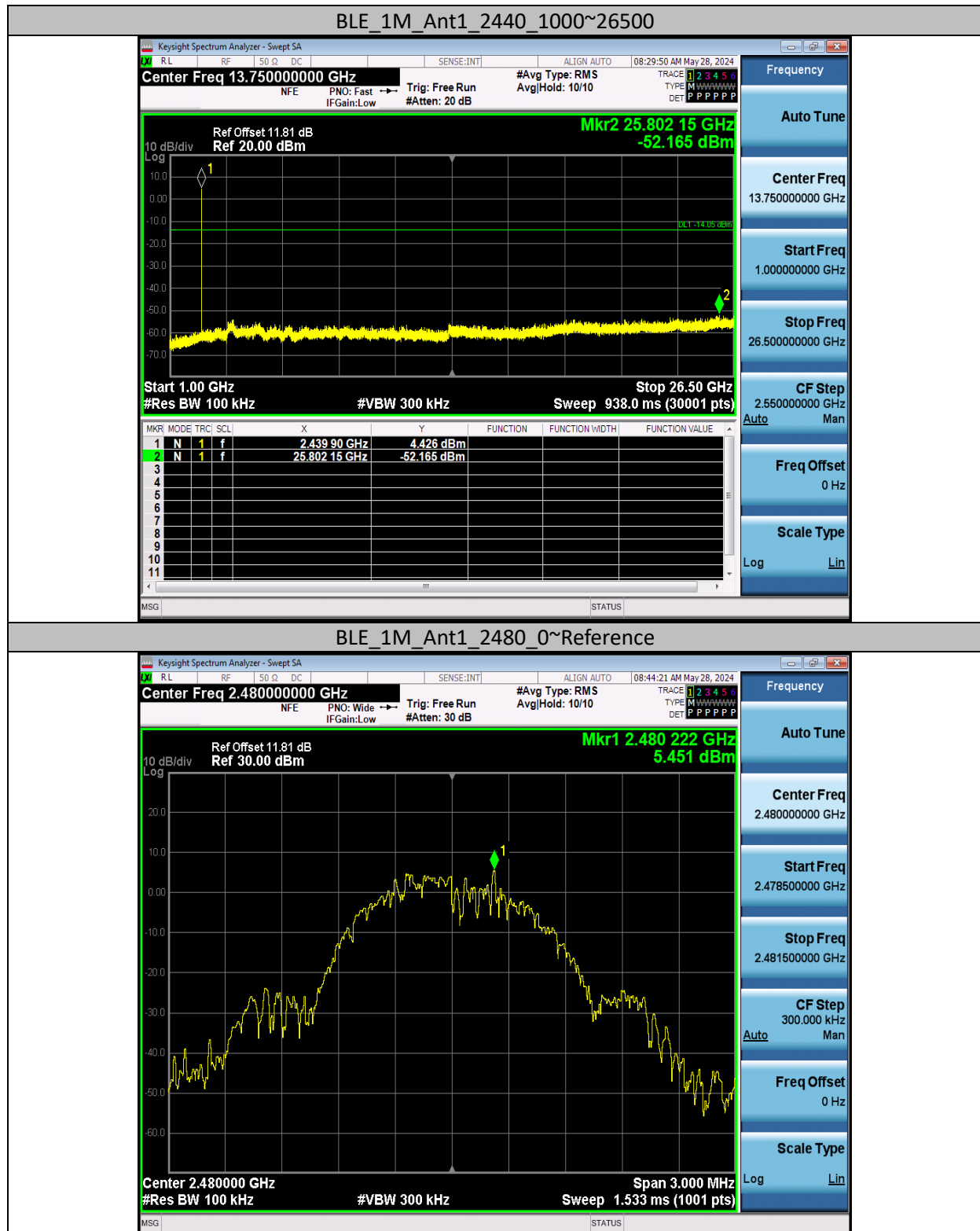
Test Mode	Antenna	Frequency [MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	5.37	5.37	---	PASS
			30~1000	5.37	-60.34	≤-14.63	PASS
			1000~26500	5.37	-52.66	≤-14.63	PASS
		2440	Reference	5.95	5.95	---	PASS
			30~1000	5.95	-61.2	≤-14.05	PASS
			1000~26500	5.95	-52.17	≤-14.05	PASS
		2480	Reference	5.45	5.45	---	PASS
			30~1000	5.45	-60.49	≤-14.55	PASS
			1000~26500	5.45	-52.81	≤-14.55	PASS

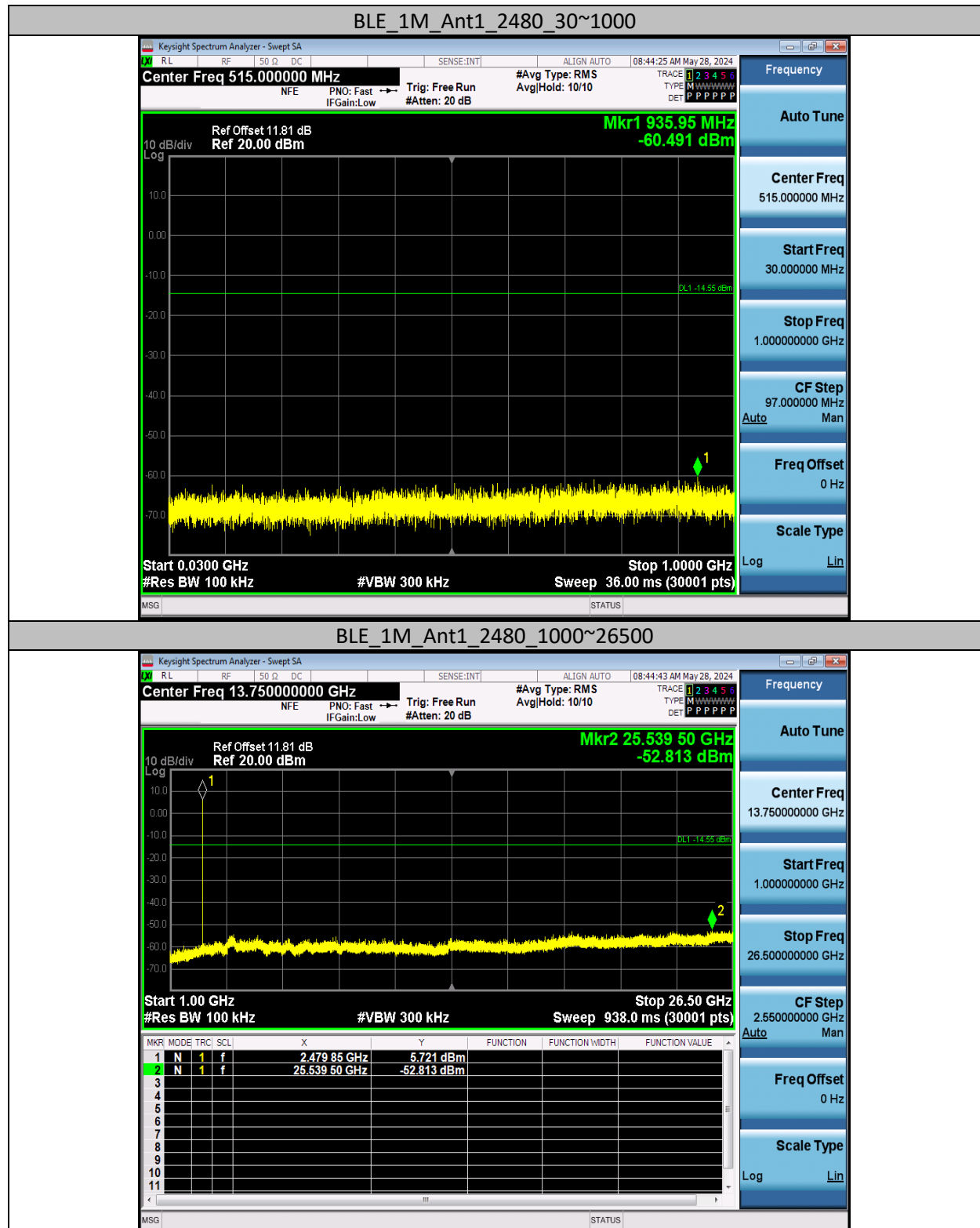
Test Plots











***** END *****